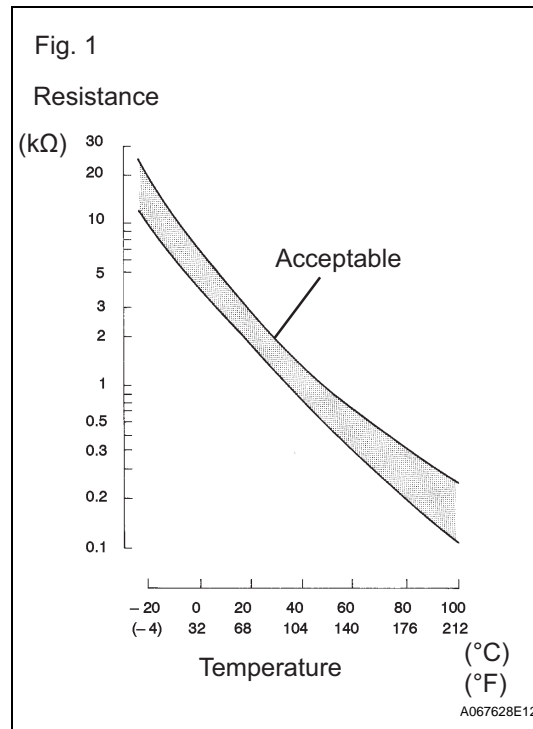


DTC	P0110	Intake Air Temperature Circuit Malfunction
DTC	P0112	Intake Air Temperature Circuit Low Input
DTC	P0113	Intake Air Temperature Circuit High Input

DESCRIPTION

The Intake Air Temperature (IAT) sensor, mounted on the Mass Air Flow (MAF) meter, monitors the IAT. The IAT sensor has a built-in thermistor with a resistance that varies according to the temperature of the intake air. When the IAT is low, the resistance of the thermistor increases. When the temperature is high, the resistance drops. These variations in resistance are transmitted to the ECM as voltage changes (see Fig. 1).

The IAT sensor is powered by a 5 V supply from the THA terminal of the ECM, via resistor R.

Resistor R and the IAT sensor are connected in series. When the resistance value of the IAT sensor changes, according to changes in the IAT, the voltage at terminal THA also varies. Based on this signal, the ECM increases the fuel injection volume when the engine is cold to improve driveability.

HINT:

When any of DTCs P0110, P0112 and P0113 are set, the ECM enters fail-safe mode. During fail-safe mode, the IAT is estimated to be 20°C (68°F) by the ECM. Fail-safe mode continues until a pass condition is detected.

DTC No.	DTC Detection Condition	Trouble Area
P0110	Open or short in IAT sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in IAT sensor circuit • IAT sensor (built into MAF meter) • ECM
P0112	Short in IAT sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> • Short in IAT sensor circuit • IAT sensor (built into MAF meter) • ECM
P0113	Open in IAT sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> • Open in IAT sensor circuit • IAT sensor (built into MAF meter) • ECM

HINT:

When any of these DTCs are set, check the IAT by selecting the following menu items on the intelligent tester: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F) or higher	Short circuit

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the IAT. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a malfunction in the IAT sensor and sets a DTC.

Example:

If the sensor output voltage is more than 4.91 V for 0.5 seconds or more, the ECM determines that there is an open in the IAT sensor circuit, and sets DTC P0113. Conversely, if the output voltage is less than 0.18 V for 0.5 seconds or more, the ECM determines that there is a short in the sensor circuit, and sets DTC P0112.

If the malfunction is not repaired successfully, a DTC is set 0.5 seconds after the engine is next started.

ES**MONITOR STRATEGY**

Related DTCs	P0110: IAT sensor range check (Fluctuating) P0112: IAT sensor range check (Low voltage) P0113: IAT sensor range check (High voltage)
Required Sensors/Components (Main)	IAT sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not present	None
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TYPICAL MALFUNCTION THRESHOLDS**P0110:**

IAT sensor voltage	Less than 0.18 V, or more than 4.91 V
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P0112:

IAT sensor voltage [IAT]	Less than 0.18 V [More than 140°C (284°F)]
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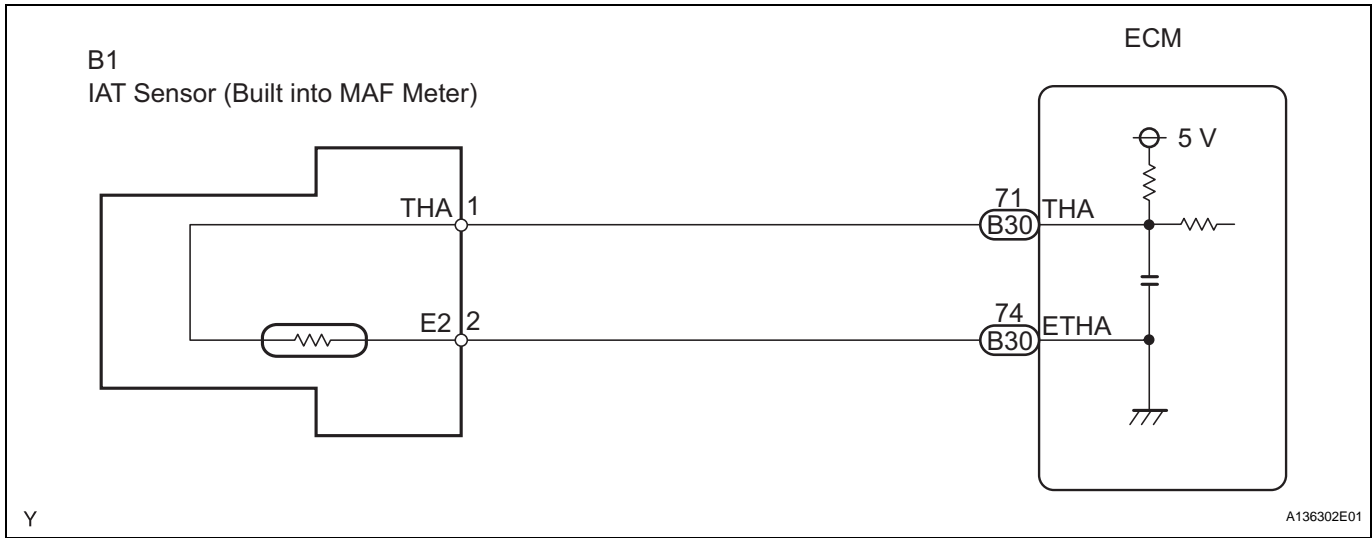
P0113:

IAT sensor voltage [IAT]	More than 4.91 V [Less than -40°C (-40°F)]
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COMPONENT OPERATING RANGE

IAT sensor voltage [IAT]	0.18 to 4.91 V [-40°C to 140°C (-40°F to 284°F)]
--------------------------	--

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the intelligent tester. Freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 READ OUTPUT DTC

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON and turn the intelligent tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read DTCs.

Result

Display (DTC Output)	Proceed to
P0110	A
P0112	B
P0113	C

B → **Go to step 6**

C → **Go to step 3**

A

2 READ VALUE USING INTELLIGENT TESTER (INTAKE AIR TEMPERATURE)

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.

- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
- (e) Read the value displayed on the tester.

Standard:

Same as actual Intake Air Temperature (IAT).

Result

Temperature Displayed	Proceed to
-40°C (-40°F)	A
140°C (284°F) or higher	B
Same as actual IAT	C

HINT:

- If there is an open circuit, the intelligent tester indicates -40°C (-40°F).
- If there is a short circuit, the intelligent tester indicates 140°C (284°F) or higher.

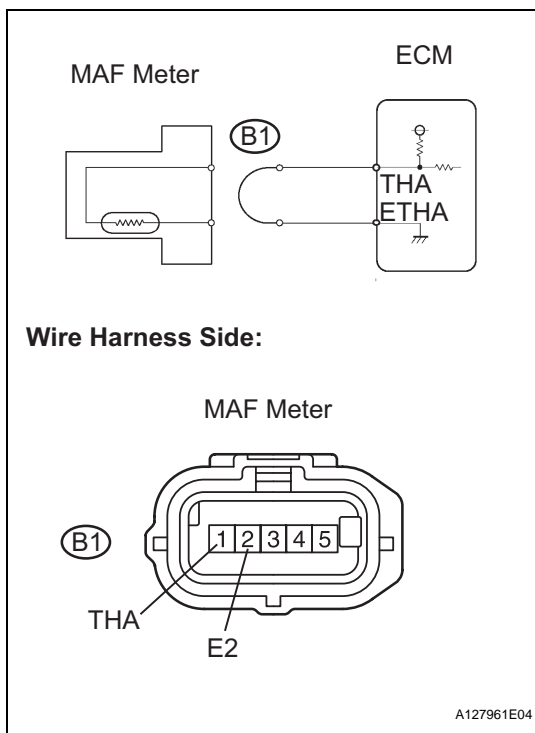
ES

B → **Go to step 5**

C → **CHECK FOR INTERMITTENT PROBLEMS**

A

3 READ VALUE USING INTELLIGENT TESTER (CHECK FOR OPEN IN WIRE HARNESS)

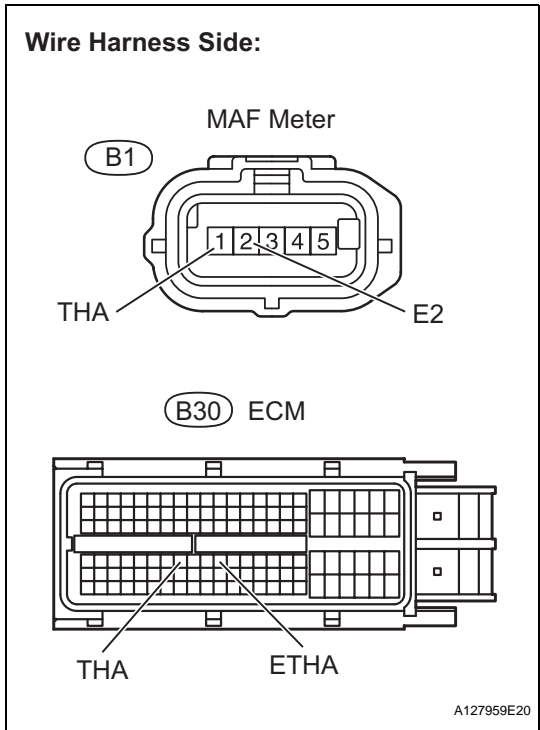


- (a) Disconnect the B1 Mass Air Flow (MAF) meter connector.
 - (b) Connect terminals THA and E2 of the MAF meter wire harness side connector.
 - (c) Connect the intelligent tester to the DLC3.
 - (d) Turn the ignition switch ON.
 - (e) Turn the tester ON.
 - (f) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
 - (g) Read the value displayed on the tester.
- Standard value:**
140°C (284°F) or higher
- (h) Reconnect the MAF meter connector.

OK → **CONFIRM GOOD CONNECTION TO SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

NG

4 CHECK WIRE HARNESS (MASS AIR FLOW METER - ECM)



- (a) Disconnect the B1 MAF meter connector.
- (b) Disconnect the B30 ECM connector.
- (c) Measure the resistance.

Standard resistance

Tester Connection	Specified Condition
B1-1 (THA) - B30-71 (THA)	Below 1 Ω
B1-2 (E2) - B30-74 (ETHA)	Below 1 Ω

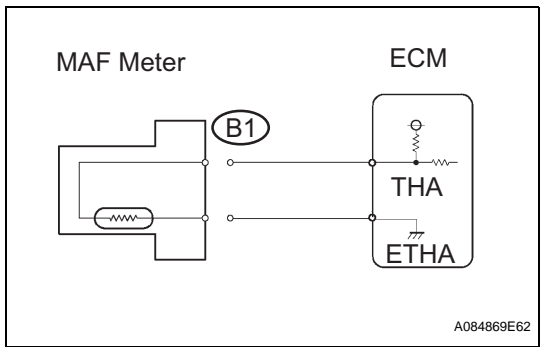
- (d) Reconnect the MAF meter connector.
- (e) Reconnect the ECM connector.

NG REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CONFIRM GOOD CONNECTION TO ECM. IF OK, REPLACE ECM

5 READ VALUE USING INTELLIGENT TESTER (CHECK FOR SHORT IN WIRE HARNESS)



- (a) Disconnect the B1 MAF meter connector.
- (b) Connect the intelligent tester to the DLC3.
- (c) Turn the ignition switch ON.
- (d) Turn the tester ON.
- (e) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
- (f) Read the value displayed on the tester.

Standard value:
-40°C (-40°F)

- (g) Reconnect the MAF meter connector.

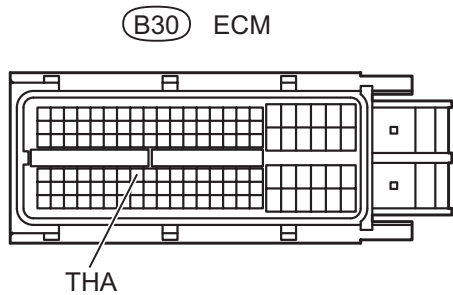
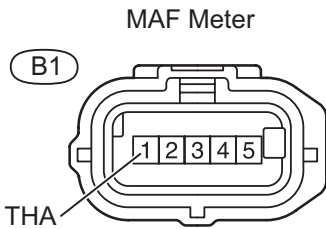
OK REPLACE MASS AIR FLOW METER

NG

ES

6 CHECK WIRE HARNESS (MASS AIR FLOW METER - ECM)

Wire Harness Side:



A127959E21

- (a) Disconnect the B1 MAF meter connector.
- (b) Disconnect the B30 ECM connector.
- (c) Measure the resistance.

Standard resistance

Tester Connection	Specified Condition
B1-1 (THA) or B30-71 (THA) - Body ground	10 kΩ or higher

- (d) Reconnect the MAF meter connector.
- (e) Reconnect the ECM connector.

NG **REPAIR OR REPLACE HARNESS AND CONNECTOR**

ES

OK

REPLACE ECM